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ABSTRACT

This report is a portion of a study of attachment behavior: behavior promoting contact and/or proximity of an infant to his mother figure. This report deals specifically with crying, response to brief everyday separations from the mother and to her return, and behavior relevant to physical contact with her. The subjects, 26 infant-mother pairs from white, middle class families, were visited at home once every three weeks from 3 to 54 weeks, each visit lasting approximately four hours. From the observer's detailed notes, a narrative record was made of infant behavior and mother-infant interaction. The findings reported in quarter-year sets illustrate developmental trends, individual differences in the behavior of both mother and infant, and the relationship between maternal and infant behavior. The researchers conclude that (1) there are important qualitative differences in infant-mother attachment relationships; (2) no single criterion of attachment can serve as an adequate basis in all cases for determining the presence of infant attachment; (3) there is no present basis for assessing strength of attachment; and (4) mother-infant interaction seems to be linked to attachment behaviors and the quality of the attachment relationship. More than one-fourth of this document consists of references, footnotes, and tables. (Author/AJ)

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INDIVIDUAL DIFFERENCES IN THE DEVELOPMENT OF SOME ATTACHMENT BEHAVIORS

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INDIVIDUAL DIFFERENCES IN THE DEVELOPMENT OF SOME ATTACHMENT BEHAVIORS[1]

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As an outcome of a study undertaken some years ago in Uganda, a number of behavior patterns were identified, through which, it was proposed, an infant becomes attached to his mother, and which, when taken together, may serve as criteria for judging that an attachment has been formed (Ainsworth, 1963, 1964, 1967). A second study of the development of infant-mother attachment was then instituted, using a sample of white, middle-class American babies, one of the purposes of which was to trace in detail the development of these patterns of attachment behavior throughout the first year of life. This present report deals with some of the findings of this study in regard to the following: crying; response to brief everyday separations from the mother and to her return afterwards; and behavior relevant to physical contact with her.

Attachment behavior has been defined as behavior that promotes contact and/or proximity of an infant to his mother figure (Bowlby, 1958; 1969; Ainsworth & Bell, 1970). Crying is classed as an attachment behavior because it provides a signal that is likely to bring an infant's mother into proximity or contact with him. The conditions that activate crying are varied--including at first hunger, pain, and cold, and probably also being out of contact with companions. Although the conditions of its termination are also various, evidence has accumulated that

crying is often effectively terminated by caretaker behaviors involving close physical contact. (See reviews by Bowlby, 1969; Ainsworth, in press.) In the earliest stages of development, crying can be considered only as a precursor attachment behavior. In view of its importance as such, its vicissitudes have been traced through the first year of life, despite the fact that it is of equivocal value as a criterion of attachment even after it has become differential and discriminating.

A baby's response to his mother's absence has generally been considered a criterion of infant-mother attachment--and indeed some (e.g. Spitz, 1965; Schaffer & Emerson, 1964) have judged it to be the criterion. There are at least two salient components of response--crying and following. Among Ganda infants (Ainsworth, 1967)crying was a frequent response to mother's everyday departures, but as babies got older they usually followed without crying. Furthermore, some infants who seemed clearly attached seemed to lack anxiety in everyday separation situations. One of the behaviors that was judged to signify their attachment was greeting the mother when she returned.

Other behaviors that seemed indicative of attachment were behaviors occurring in relation to physical contact with an attachment figure. Specifically noted were: approaching the mother, clambering onto her lap, "scrambling" over her exploring her face and person, and burying the face in her lap. Some infants who did not consistently cry or follow mother when she left were conspicuous for active contact behaviors

such as these. Furthermore, these behaviors were highly differential and not at all promiscuous in regard to the figures toward whom they were directed.

Not all Ganda infants showed all varieties of attachment behavior. There seemed to be striking individual differences in the way attachment behaviors were organized together and directed toward an attachment figure. It is our purpose here to examine these same attachment behaviors in our current American sample, to report some findings about their development, and to consider individual differences and some of the conditions associated with them.

Method

Subjects

The subjects are 26 infant-mother pairs from white, middle-class families in the Baltimore area, who were initially approached through pediatricians in private practice, usually before the baby's birth. Sixteen of the babies were boys; 10 were girls. Six were first babies, and 20 were not.

Data-collection procedure

The subjects were visited in the home environment once every three weeks from 3 to 54 weeks, each visit lasting approximately four hours.[2] Detailed notes were taken by the observer during the visit; these were subsequently dictated and transcribed as a narrative record of infant behavior and of mother-infant interaction. Continuous, direct observation

and subsequent narrative reports were chosen in preference to time-sampled, coded observations, both to preserve the continuity of the flow of interaction and to avoid limiting observations to a preconceived check list of behaviors. Although narrative records have been very much more laborious to analyse than check-list observations would have been, the resulting flexibility of analysis has justified the extra expenditure of effort.

Data-analysis procedures

In processing this detailed and voluminous mass of raw data a variety of procedures have been used, including coding, rating, and classification (Ainsworth & Bell, 1969; Ainsworth, Bell & Stayton, in press; Stayton, Hogan & Ainsworth, in press) but the present report is limited to the findings yielded by meticulous coding of infant behavior and maternal behavior relevant to it.

The codings were carried out by a number of students and clerical assistants, each working independently and without effective knowledge of our hypotheses or of other findings to date. Reliability was sought through careful preliminary training of the coders, and through repeated reliability checks.

Coding of crying. Crying was the only attachment behavior to be coded specifically. Each instance of crying that occurred in the course of a home visit, from the beginning of the first year to its end, was coded. Among the particulars coded were: the type of cry, its duration,

its temporal relation to the time of last feeding, other circumstances under which it occurred, the adult interventions (if any) to which it gave rise, the infant's responses to these interventions, and the conditions under which the cry was finally terminated.

From the analysis of the codings of crying, two chief aspects have been chosen for consideration here: the amount an infant cries, and his mother's response to crying. Two measures of amount of crying were used: frequency of crying expressed as number of episodes per hour, and duration of crying as measured in minutes per hour. The frequency measure included all cries and fusses, whether prolonged, intermittent, or extremely brief. The duration measure excluded extremely brief or momentary cries. Only a baby's waking hours during the visit were considered.

Several measures of maternal responsiveness to crying were used: the number of cries which a mother ignored, the length of time that a baby cried without obtaining a response from her (i.e. the duration of maternal unresponsiveness), the types of intervention produced by a mother , and finally the conditions which successfully terminated a cry. An episode of crying was considered to have terminated when a baby remained quiet for more than two minutes.

When correlating the frequency of infant crying with maternal ignoring of crying within the same quarter, it was necessary to correct the infant crying measure in order to avoid confounding. The corrected

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measure excluded episodes that the mother ignored, and thus was based solely on the number of episodes to which the mother responded. Similarly, when correlating the duration of infant crying with the duration of maternal unresponsiveness within the same quarter, confounding was avoided by using as the measure of duration of infant crying the total duration of the cry minus the period during which the mother was unresponsive to it.

Maternal interventions were classified as follows:

a. Picking up and holding or rocking, or shifting a baby's position (excluding picking up in the course of routines.)

b. Touching: physical contact such as touching or patting, without picking a baby up.

c. Interaction: approaching a baby closely and bending over him, smiling, talking, or initiating play not involving touching or picking up.

d. Routines: feeding, changing, dressing, bathing, transporting.

e. Toys, pacifier: distracting a baby with a toy or other object, or giving him a pacifier to suck.

f. Entering room: merely coming into a baby's visual and auditory range, perhaps with a spoken greeting, but without approaching him to initiate some kind of interaction.

g. Other.

The effectiveness of a maternal intervention was judged by whether it terminated the cry. An episode of crying was considered to have been terminated if a baby remained quiet for more than two minutes.

Scores for each measure were obtained for each visit and then averaged for each of the four quarters of the first year.

Coding of responses to leave- and enter-room situations. In the case of attachment behaviors other than crying the coding did not begin with the behavior itself, but rather with a "critical" situation that seemed likely to activate the behavior, so that both occurrence and non-occurrence of expected behaviors could be counted. Among such critical situations was the departure of a person from the room in which an infant was situated. Among the particulars coded for leave-room situations were: who left, the behavior of the departing person, where the baby was (e.g. in crib, playpen, on floor), who remained with the baby if anyone, what the baby was doing at the time of the departure, and what his responses to the departure were. The particulars coded for enter-room situations were comparable.

The analyses to be reported here include only the mother's departures and entrances, and cover only the third and fourth quarter years. The infant responses considered for leave-room situations are crying and following. A distinction was made between crying at nap-times (and other situations in which a baby was put down immediately before his mother left the room) and simple leave-room episodes not complicated by a put-down; only the latter are dealt with here. All kinds of cries and fusses were counted, however brief.

A baby was judged to have followed only if he went the full distance

necessary to get into visual range of his mother, or at least as far as a barrier that prevented him from going farther. At any given age level following was scored only for those infants who had acquired locomotion, i.e. at least the ability to make forward progress, however feeble and slow. Furthermore, scoring was done only for leave-room episodes in which a baby was unconfined and free to follow.

Two main classes of response to mother's entrance are considered here--responses which, for convenience, have been labelled "positive" and "negative." Positive greetings included smiling, laughing, non-crying vocalizations, reaching, bouncing, and approaching. Negative greetings chiefly consisted of crying or fussing. This category included also proximity-avoiding responses such as clear-cut turning away or looking away. (These latter are so different from crying that it is perhaps not justifiable to class them together, but their occurrence was very rare.) Instances in which positive and negative responses occurred simultaneously were classified as negative.

The only maternal behavior that is considered here is the frequency per hour of departures.

Coding of behavior relevant to physical contact. Each instance of a baby being picked up was coded, noting such particulars as: who picked him up, whether he or the adult figure initiated the pick up, what he was doing before he was picked up, qualitative features of the pick up, its apparent purpose, and his response to it. If the baby was then held, further items were coded: his behavior while being held, and the behavior of the adult holding him. When he was put down the following were coded: whether he or the adult initiated the put down, his response to being put down, and the adult's response to his behavior. In addition, all instances were coded of physical contact such as touching which did not involve picking up, although this paper will deal only with instances of pick up, hold and put down.

So far, the analysis of physical-contact behavior has been completed only for the first and fourth quarters of the first year. Maternal behaviors were considered in regard to their frequency (the number of times per hour a mother picked up her baby), duration (the minutes per hour during which she held her baby), and quality. Both the frequency and the duration measures were broken down to reflect the purposes of the contact, whether for a routine such as feeding or non-routine. Further specification of the non-routine measures offers some reflection of quality; the specifications considered here are whether the pick up was to show the baby affection, or whether it was abrupt and/or interfering. Finally, quality was specifically assessed in

terms of the percentage of holding time during which a mother was described as tender and careful in her handling, or inept, grossly inadequate, and/or abrupt.

The analysis of infant behaviors reported here deal with four aspects of physical contact: response to being picked up and held, response to being put down, initiations of contact, and initiations of cessation of contact. Responses to being picked up were identified as positive, neutral or negative. In the first quarter positive responses were distinguished by smiling or an increase in activity that was described as "happy." In the fourth quarter the criteria of a positive response did not include mere smiling but were limited to expressions of delight or active behavior--laughter, kissing, hugging, clinging, "sinking in", exploring the mother's face or person, burying the face against her, and the like. Negative responses to holding included beginning to cry, or resisting contact by squirming or stiffening. In the fourth quarter negative responses included also pushing away, hitting, biting, and so on.

Positive responses to being put down included those in which a baby either smiled, or otherwise seemed happy when the contact was discontinued. In the fourth quarter a positive response was usually turning cheerfully to some independent activity. Merely to accept being put down was not scored as a positive response. Negative responses to being put down included all instances in which a baby cried when

put down or made clear gestures that he wanted to be picked up again.

Initiations of contact were scored only in the fourth quarter--when a pick-up episode was preceded by the baby's spontaneous reaching, locomotor approach, or actual clambering up, in the absence of any invitation from his mother. Initiations of put-downs were also scored only in the fourth quarter--when a put-down was preceded by the baby's squirming or otherwise actively indicating that he wanted down.

Findings

The findings reported here illustrate (a) developmental trends, (b) individual differences in the behavior of both mother and infant, and (c) the relation between maternal and infant behavior. Some discussion of the different sets of findings is offered in this section, reserving the concluding section for more general issues.

Crying

First, let us consider developmental changes in the amount of crying. Figure 1 shows that there is some decline in the duration of crying from a median of 7.7 minutes per hour in the first quarter year,

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Insert Figure 1 about here

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to a low of 3.9 minutes in the third quarter, with a slight increase to 4.4 minutes in the last quarter. The wide range shows that there are great individual differences in crying, from 21 minutes per hour in the first quarter to almost no crying at all. Although the range

narrows somewhat in the course of the first year, it is clear that substantial individual differences remain.

Episodes of crying occurred at a median frequency of 3.6 per hour in the first quarter and did not change significantly throughout the rest of the first year. There was a wide range, which scarcely narrowed at all.

Although it was obvious from the narrative records that some of the individual differences, especially in the first quarter, were related to differences in infant condition, such as colic or hunger (Ainsworth & Bell, 1969), this report is concerned not with the causes of crying but with the effect on amount of crying of maternal responsiveness to it. Table 1 shows the relationship between two measures of maternal responsiveness (or unresponsiveness) and two measures of the amount of infant crying. The findings suggest that during the first quarter of the first year there is little tendency for infants whose mothers are unresponsive to them to cry more--or less-- than infants whose

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Insert Table 1 about here

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mothers are responsive. Within each of the subsequent quarters, however, and especially clearly and consistently in the third and fourth

quarter, there are farily strong and significant tendencies for babies whose mothers ignore their crying or delay in responding to it cry more frequently and/or for longer periods than do those whose mothers are more promptly responsive.

The last three rows in Table 1 show the relationship between infant crying in one quarter and maternal responsiveness in the preceding quarter. Babies cried more frequently in one quarter whose mothers tended to ignore many episodes of crying in the preceding quarter. Babies cried longer in one quarter whose mothers were slower in responding to them in the preceding quarter. These findings suggest that stable, interlocking patterns of maternal and infant behavior tend to become established by the second quarter of the first year.

There is, however, some time lag between maternal response to crying and its effect on infant crying behavior, which testifies to the strength and deep-rooted nature of this behavioral system. It apparently takes some three months to modify it. It may be hypothesized that only a long-term and fairly consistent experience of being responded to permits an infant himself to delay his cry when in a condition or circumstance which tends to activate crying behavior.

It seems likely that three interrelated developmental processes are implicated in the reduction of crying: the development in the infant of expectations that his mother will respond to his signals when he gives them, of increasing competence to control what happens to

him, and of more varied modes of communication other than crying. It seems reasonable that an infant whose mother has responded to him promptly in the past should develop both trust in her responsiveness and confidence in his increased ability to control what happens to him. In regard to more varied communication, we assessed our sample in the fourth quarter[3] and found a significant tendency for those with more varied, clear, and subtle modes of communication to cry less than those who had a more limited range of communication (with duration of crying, $r = -.71$; with number of episodes of crying, $r = -.65$)

These findings are, of course, inconsistent with the views of those who assume that to respond to crying is to reinforce it, so that mothers who respond promptly are likely to have "spoiled" babies who cry more, whereas mothers who refuse to reward this changeworthy behavior by responding to it should themselves be rewarded by having babies who cry little. According to our data the reverse is true.

In the first quarter the average mother responded to only 53% of her baby's cries, and in the fourth quarter to 62%. Table 2 shows

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Insert Table 2 about here

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what she did when she responded. The most frequent intervention was to pick the baby up, and the next most frequent to attempt to initiate an interaction not involving physical contact. It was also fairly frequent to institute a routine, or to touch or pat the baby without

actually picking him up. The order of preference in interventions was essentially the same in the fourth quarter as in the first.

Let us next examine the effectiveness of these various interventions in terminating cries. It is clear that physical contact emerges as the most consistently effective terminator of crying; picking a baby up stopped his crying 86% of the times in which it was used as an intervention in the first quarter, and was scarcely less effective in the fourth quarter. This degree of effectiveness is remarkable when one notes that it occurred irrespective of the conditions that activated crying. The next most effective intervention was to institute a routine. It is noteworthy, however, how effective all modes of intervention proved to be. To distract a baby with a toy or to give him his pacifier worked more often than not. Merely to enter the room is fairly effective also. Indeed, regardless of what these mothers did, 65% of their interventions were effective in the first quarter and 66% in the fourth.

This analysis, of course, entirely ignores the appropriateness of the intervention. These figures may be inflated by the sensitivity of some mothers to what was causing the cry. Nevertheless, these data suggest, in conjunction with the findings on ignoring cries and delay in responding to them, that it is of primary importance to the baby that his cry be responded to promptly whether the intervention is appropriate or not. At least interventions tend to bring the mother

into closer proximity.

Despite the fact that mere crying is not a criterion of attachment, the extent to which a baby's relationship with his mother does or does not feature crying seems to be a significant reflection of the quality of the attachment relationship. Among Ganda babies (Ainsworth, 1963, 1967) a distinction was made between secure and insecure attachment relationships in terms of how much a baby cried even when he was with his mother. These findings from Baltimore infants tend to confirm the usefulness of a security-insecurity dimension in the assessment of infant-mother attachment. Furthermore these data suggest that this dimension reflects a history of the degree of responsiveness an infant's mother has shown to his cries.

Responses to brief, everyday separations

The analysis of brief, everyday separations includes all instances in the third and fourth quarters of a mother's leaving the room. These departures occurred with a mean frequency of 3.5 times an hour. In Figure 2 the lower curve shows the frequency of crying in response to

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Insert Figure 2 about here

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simple leave-room situations, not complicated by naptimes or preceding put-downs. At 27 weeks of age infants in this sample cried on the average 18% of the times that their mothers left the room. This is clearly not frequent, but at no age did the mean incidence of crying

in leave-room situations exceed 28%. This suggests that anxiety in everyday separation situations is not an ubiquitous phenomenon, not even by the fourth quarter when all of the babies in this sample were judged to have become attached to their mothers.

It may be noted that there are two peaks in this curve, one occurring at 33 weeks and the other at 45 weeks. We have two hypotheses about these two peaks. One hypothesis is that the earlier peak reflects the acquisition of discrimination of the mother from other figures across some distance (an acquisition that Ainsworth found for Ganda infants to precede the emergence of several important active attachment behaviors) and that the second peak reflects the consolidation of a "true" attachment relationship. Our second hypothesis is that the decrement in separation crying which takes place in the period between 36 and 42 weeks of age reflects the infant's pleasure in exercising his newly acquired ability to crawl--a pleasure that may temporarily distract him from his concern about his mother's whereabouts. Indeed this is the period during which the majority of babies in the sample first used locomotion in a truly efficient manner. Following this reasoning, the decrement at the end of the first year may also be attributable to new locomotor skills, including walking in some infants, as Schaffer & Emerson (1964) have suggested.

The upper curve in Figure 2 shows the incidence of following when the mother leaves the room. Each point on the curve is based on those

babies who, at the age-point in question, could crawl or walk. Before 36 weeks a substantial proportion of infants had not yet acquired locomotion, but by 36 weeks all but two had done so, and hence the curve begins there. It is clear that by 39 weeks of age, babies who are free to do so follow the mother much more often than they cry when she leaves the room. By 48 weeks the average baby followed 58% of the times he was free to follow.

The frequency with which the mother left the room was found to be quite uncorrelated with either crying or following.

Crying and following must be considered to be fairly independent of each other as responses to the leave-room situation; indeed the correlation between them tends to be negative. (See Table 3.) Crying in everyday separation episodes was, however, correlated significantly with the general measure of duration of crying (.51 in the third quarter and .57 in the fourth) whereas following was not significantly related

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Insert Table 3 about here

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to crying in general.

Greeting responses

Positive greetings occurred in 32% of enter-room episodes in the third quarter and in 36% in the fourth. Negative greetings were rarer--11% in the third quarter and 14% in the fourth. These figures imply

that in about half of the enter-room episodes the average baby responded in no significant way, except perhaps to look.

Table 3 shows the relationship of positive and negative greetings, and their relationship to leave-room responses and to crying in general in the fourth quarter. It may be seen that there is a significant negative correlation between positive and negative greetings. Positive greetings are positively related to following when the mother leaves the room, but negatively related both to crying when the mother leaves the room and to the duration of crying in general. Negative greetings are positively related to crying when mother leaves the room and to crying in general, although they are not significantly related to following. Thus greetings as well as crying when the mother leaves the room seem related to the security-insecurity dimension of attachment. A baby who greets his mother with a fuss is not likely to be unattached, but he is likely to be feeling insecure at least at the time.

Behavior relevant to physical contact

Let us first consider maternal behavior relevant to physical contact. A striking reduction was found in the total time during which the average mother held her baby--from 21 minutes per waking hour in the first quarter to 5.8 minutes in the fourth quarter. This decrease was almost entirely accounted for by a decrease in holding for feeding. In both quarters the mean number of pick-up episodes was about three per hour, but in the first quarter 68% of these were concerned with

routines, whereas in the fourth quarter 71% were for non-routine purposes. A tender, careful quality characterized 37% of the total duration of holding in the first quarter, and substantially less in the fourth quarter. Inept, abrupt, inadequate holding was infrequent and tended to be confined to but a few mothers.

Infants increase in incidence of positive response to physical contact from 16% of the pick-up episodes in the first quarter to 26% in the fourth, and decrease in negative response from 20% to 13%. These figures imply, of course, that in both quarters a baby accepts contact much of the time without seeming either markedly happy or unhappy about it. Positive responses to being put down occurred in only 9% of the episodes in the first quarter, but in 63% of the episodes in the fourth. Negative responses occurred in 43% of put-down episodes in the first quarter and in 31% in the fourth. Initiations of being picked up occurred in only 18% of pick-up episodes in the fourth quarter. Initiations of being put down occurred very rarely--in only 3.5% of the put-down episodes.

Individual differences in babies' responses to contact are suggested by the correlation matrix shown in Table 4. This shows only fourth-quarter

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Insert Table 4 about here

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behavior. Babies who respond positively to being held, and thus with active attachment behavior tend to initiate being picked up by active

reaching or approaching. They do not, however, protest being put down; on the contrary, they tend to accept this happily and to turn immediately to independent activity. Even in the first quarter there was a significant tendency for babies who responded positively to being held not to cry when put down. It seems that infants who especially enjoy physical contact with their mothers and who initiate active interaction while being held get enough out of an episode of holding that they are usually cheerful about its cessation. Babies who respond negatively to being held tend, as might be expected, to be the ones to initiate put-downs by squirming (although even they do so rarely) but then they do not tend to move off cheerfully into independent activity. In the fourth quarter they do not tend to protest being put down, but in the first quarter they tended to do so. Babies who protest being put down in the fourth quarter tend not to respond positively to holding.

Individual differences are also conspicuous in maternal behavior. Table 5 shows the correlation matrix of maternal behaviors in the first

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Insert Table 5 about here

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quarter. The qualitative and quantitative aspects of holding are interlocked in a complex way. Let us first consider the qualitative. It is clear that mothers whose holding is often tender and careful in quality tend not to be inept and inappropriate in their handling. They

relatively frequently initiate pick-ups merely to express affection, and they tend not to pick a baby up abruptly. Ineptness in holding is, however, strongly associated with abrupt pick-ups.

There is a tendency (just short of statistical significance) for mothers who hold their babies for relatively long periods when they do pick them up to pick them up less frequently. This might seem an artifact, especially in the first quarter when the total duration of holding is as much as 21 minutes per hour. But in the fourth quarter, when holding occupies less than 6 minutes per hour, there is a significant negative correlation between the duration of a non-routine pick-up episode and the frequency of pick-up episodes ($r = -.39$). Furthermore, detailed case material that cannot be presented here suggests a genuinely inverse relationship between frequency of pick-ups and the duration of holding. It may be seen also in Table 5 that mothers who hold their babies longer for non-routine purposes in the first quarter tend to initiate pick-ups as an active expression of affection. Such mothers in the fourth quarter also tend not to be abrupt and interfering in their pick-ups ($r = -.42$).

There is strong evidence that individual differences in mothers and babies are related. Table 6 shows the relationships in the fourth quarter. Mothers who hold their babies relatively long in non-routine situations (and who also pick them up less frequently) tend to have babies who respond positively with active attachment behavior, who

sometimes take the initiative in instituting contact, but who respond cheerfully to being put down. The observational data suggest the term "well-rounded" to describe an episode of contact-interaction in these mother-infant pairs. Mothers who often initiate affectionate contacts

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Insert Table 6 about here

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also tend to have babies who respond positively and actively both to being held and to being put down. On the other hand, mothers who have more frequent (and briefer) episodes of holding tend to have babies who do not respond positively when in contact, and yet who protest after they have been put down--an obviously ambivalent kind of behavior. Mothers who are abrupt and interfering in their pick-ups tend to have babies who respond negatively to contact and who squirm to get down. Thus, it appears, both quantitative and qualitative aspects of maternal handling are related to individual differences in infant response.

In the first quarter, it was clearly the qualitative aspects of holding that were more closely related to infant responsiveness than the duration or frequency of the pick-up episodes. Babies whose mothers were often tender and careful tend to respond positively to being picked up ($r = .43$), and, even when so young, not to protest being put down ($r = -.57$). Most conspicuous, however, was the response of infants to mothers who pick them up abruptly; they tend to respond negatively to holding ($r = .51$), and to cry when put down ($r = .39$).

Table 7 shows the relationship between certain maternal behaviors in the first quarter and infant behavior in the fourth quarter. Babies who in the fourth quarter respond positively to being held tend to have had relatively long episodes of holding in the first quarter unrelated to routines, and/or to have often experienced a tender, careful quality of holding. They tend not to have been picked up abruptly or for frequent brief periods. Babies who in the fourth quarter initiate physical contact relatively frequently tend to be those who in the first quarter had experienced relatively long periods of non-routine holding. Babies who in the fourth quarter cry when put down tend to

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Insert Table 7 about here

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be those who in the first quarter were picked up frequently but briefly. These findings suggest that experience with contact in the first quarter has a significant continuing effect on babies.

Finally, let us compare babies' responses to physical contact with their responses to mother's leaving and entering the room and with the amount that they cry in general. Some of these relationships are shown in Table 3. It may be seen that those who respond positively and actively to being held tend also to greet their mothers positively when they return from brief everyday absences, and tend to cry little in general. Those who respond positively to being put down tend neither to cry

frequently when mother leaves the room nor to cry much in general. Conversely, babies who respond negatively to being held tend to cry relatively frequently (r = .46), and so do babies who protest when put down (r = .40), and babies who initiate cessation of physical contact (r =.41).

Conclusions

Although it was judged that all infants in this sample showed clear signs that they had become attached to their mothers by the end of the first year of life, it is evident that they differed conspicuously in the ways in which they manifested this attachment. Some showed fairly frequent separation disturbance, but others did not. Some showed their attachment in highly differential and active affectionate and interactive behavior when in physical contact with their mothers, while others seemd ambivalent to contact or not especially to care for it. Some greeted their mothers with delight when they returned after brief everyday absences, some greeted with a fuss, and some rarely showed either kind of greeting.

It has seemed appropriate to infer a dimension of security-insecurity to characterize the quality of an attachment relationship. The data link amount of crying, everyday separation anxiety, negative greetings and negative responses to physical contact together, while relatively little crying tends to be associated with positive greetings and positive responses to physical contact. Useful though it might be to assess the insecurity-security dimension, such an assessment would

be a great over-simplification. Not all attachment behaviors fit clearly into such a dimension. For example, following the mother when she leaves the room is not associated especially with either secure or insecure poles. Sometimes following may chiefly reflect insecurity evoked by mother's departure; at other times it may reflect active initiative in approaching the mother with a flavor of confidence and positive affect. Other analyses of behavior both at home and in strange situations have suggested other dimensions for the assessment of the quality of attachment--for example, the balance between exploratory and attachment behavior, and activity-passitivity in both exploration and in the initiation of interaction, proximity, and contact (Ainsworth & Wittig, 1969; Ainsworth & Bell, 1970; Ainsworth, Bell & Stayton, in press).

Nevertheless the data here presented, together with less systematic data yielded by a study of Ganda babies, lead us to four conclusions:

1. There are conspicuous individual differences in the way an infant organizes his attachment behaviors to mediate attachment to his mother figure, and thus there are important qualitative differences in infant-mother attachment relationships.

2. No single criterion of attachment, whether it be separation anxiety or following or active contact seeking, can serve as an adequate basis in all cases for judging whether or not a baby has yet become attached--at least when the assessment is based on everyday behavior at home.

3. Lacking a single satisfactory criterion, there is no present

basis for assessing strength of attachment. It seems likely that nearly all family-reared infants become attached to a mother figure, and fail to do so only under circumstances of extreme insufficiency of interaction. At present it seems more productive to explore qualitative differences in attachment relationships than to try to assess their strength.

4. Finally, although the data of this study throw no light on the influence of constitutional differences on the development of infants' attachment behaviors, they do show a variety of ways in which mother-infant interaction is linked to, and presumably affects, attachment behaviors and the quality of the attachment relationship. Further study of these linkages would be profitable in progressing toward a better understanding of the origins of important individual differences in personality.

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Footnotes

1. This paper was presented at the Merrill-Palmer Institute Conference on Research and Teaching of Infant Development, February 11-13, 1971. The research upon which it is based has been supported by grant 62-244 of the Foundations' Fund for Research in Psychiatry, and by USPHS grant RO1 HD 01712; this support is gratefully acknowledged. We are also deeply grateful to Barbara A. Wittig, George D. Allyn, and Robert S. Marvin II, who carried out many of the original observations; Mary P. Blehar and Mary B. Main, who completed some of the data analysis here reported; and the following whose conscientious coding of the behavioral observations made this paper possible: Nelson Bingham, John Conklin, Ross Connor, Paul Giblin, James Koch, Susie Kohan, Karen Kowalski, Terry Leveck, Rick Lieberman, Herbert Markley, Eleanor McCulloch, and David Olds.
2. In the case of the last 11 cases, visits were made at 1, 2, 3, 4 and 6 weeks of age and thenceforward every three weeks. The first four visits lasted approximately two hours.
3. A 7-point scale for rating infant communication was applied, but was found to require differentiations too fine for our data in some cases. The ratings were condensed to a 3-point scale, which yielded the measures used here.

Figure Captions

Figure 1. Duration of crying.

Figure 2. Responses to mother leaving room.

Duration of Crying

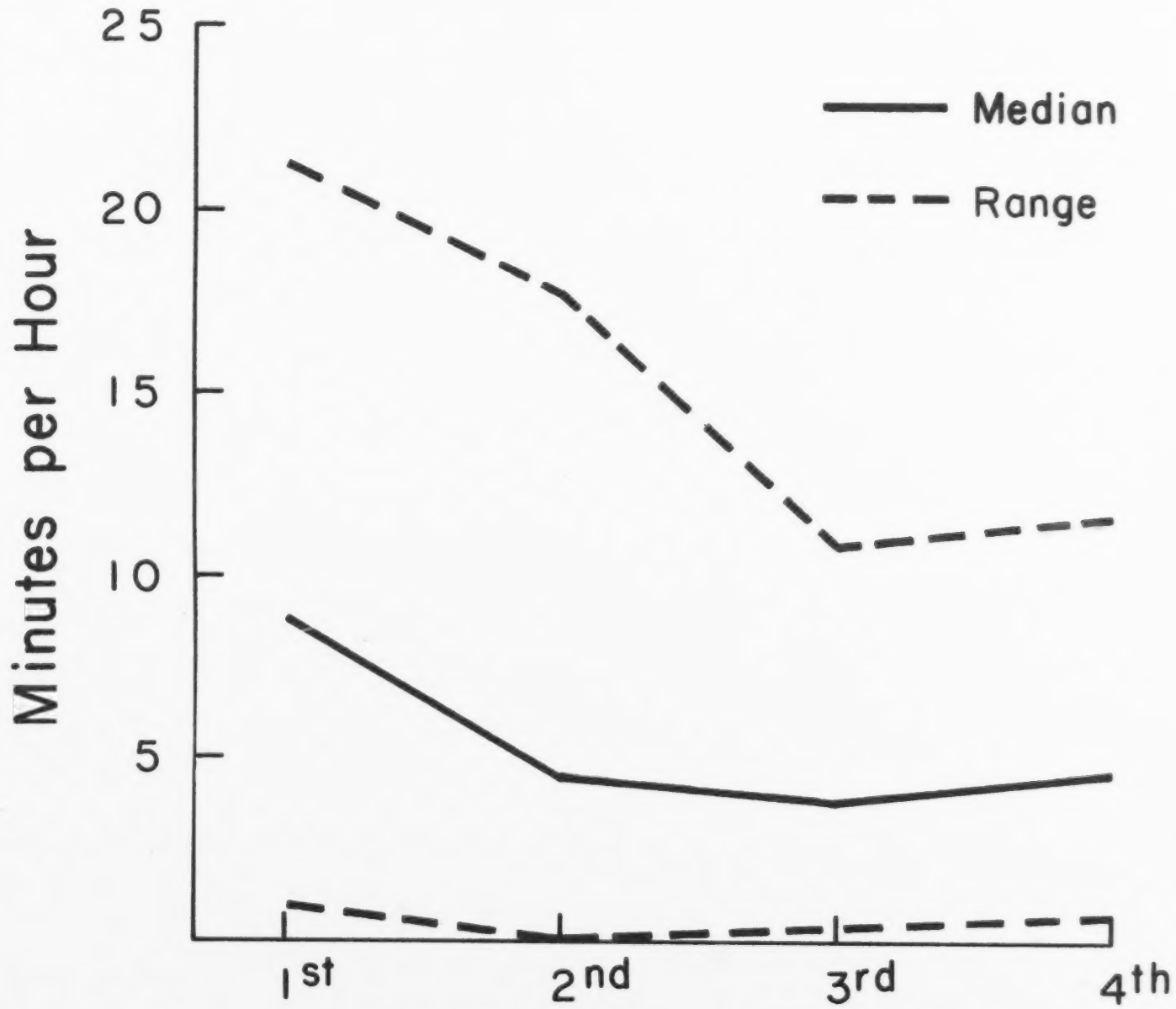

Table 1

Maternal behavior and infant crying

(Rho coefficients)

Quarters of first year			Episodes ignored by M vs.:	M's unresponsiveness to crying vs.:
M's behavior in:		B's behavior in:	Frequency of B's crying	Duration of B's crying
Quarter 1	vs.	Quarter 1	-.04†	.19†
Quarter 2	vs.	Quarter 2	.35†	.67**†
Quarter 3	vs.	Quarter 3	.42*†	.39*†
Quarter 4	vs.	Quarter 4	.45*†	.61**†
Quarter 1	vs.	Quarter 2	.56**	.45*
Quarter 2	vs.	Quarter 3	.39*	.42*
Quarter 3	vs.	Quarter 4	.52**	.51**

* $p < .05$

** $p < .01$

† infant measure corrected to avoid confounding

Table 2

Maternal interventions to infant crying

and their effectiveness

Maternal Intervention	First Quarter		Fourth Quarter	
	% of Total Interventions	% Effectiveness	% of Total Interventions	% Effectiveness
Picking up	38	86	29	84
Interacting	22	40	17	45
Routines	14	77	15	77
Touching	13	41	9	66
Toys, pacifier	7	60	7	55
Entering room	2	46	7	61
Other	4	75	16	54

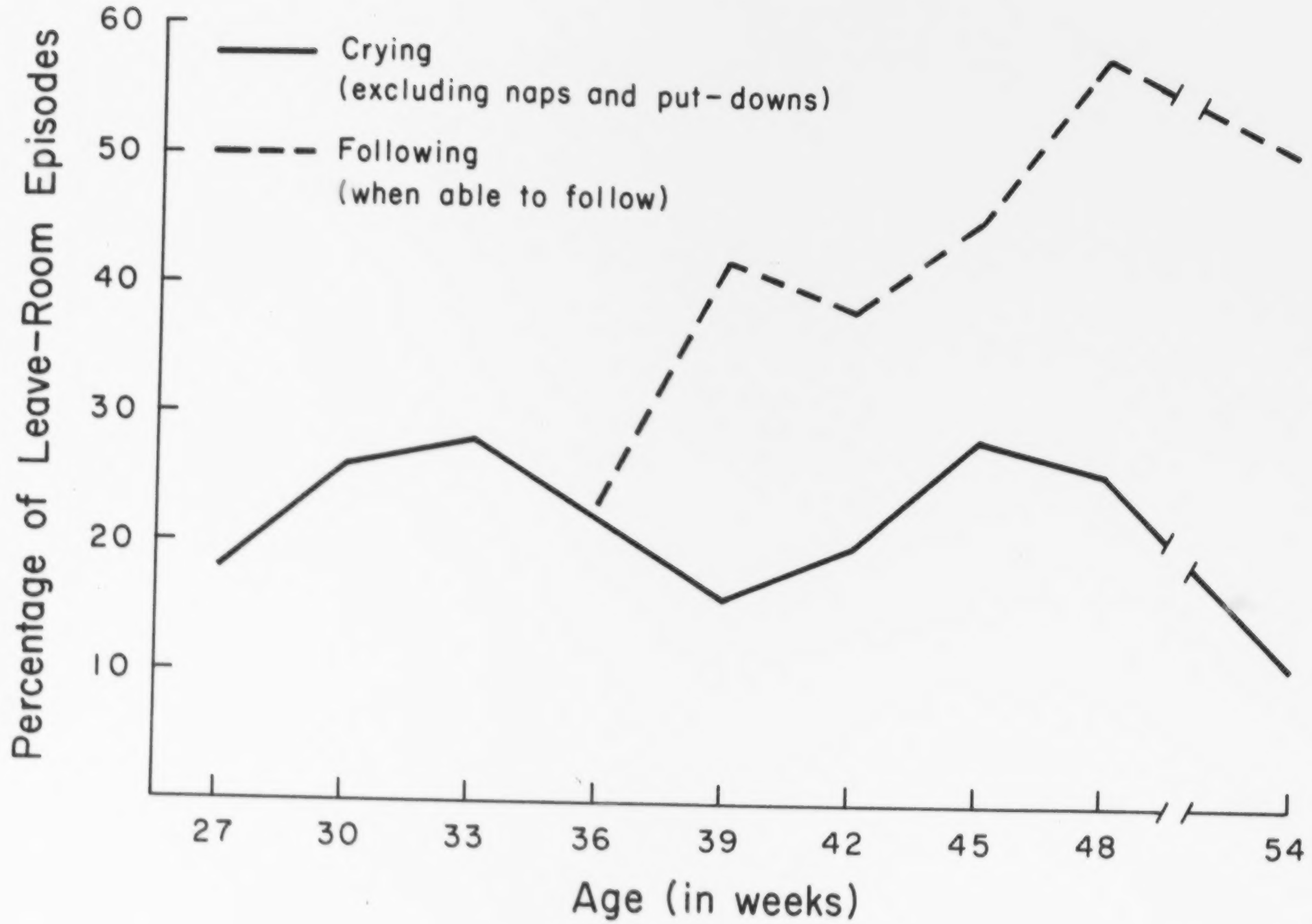
Percentage of Leave-Room Episodes
60
50
40
30
20
10
Crying
(excluding naps and put-downs)
Following
(when able to follow)
27
30
33
36
39
42
45
48
54
Age (in weeks)

Table 3

Intercorrelations among some attachment behaviors in the fourth quarter

Attachment behaviors	Duration of crying	Crying when M leaves	Following when M leaves	Positive greetings	Negative greetings	Positive to holding	Positive to put-down
Duration of crying	...	.57**	-.14	-.48*	.51**	-.57**	-.53**
Crying when M leaves	.57**	...	-.34	-.46*	.54**	-.20	-.39*
Following when M leaves	-.14	-.34	...	.42*	-.26	.09	.26
Positive greetings	-.48*	-.46*	.42*	...	-.44*	.39*	.30
Negative greetings	.51**	.54**	-.26	-.44*	...	-.31	-.23
Positive to holding	-.57**	-.20	.09	.39*	-.31	...	.38
Positive to put-down	-.53**	-.39*	.26	.30	-.23	.38	...

* $p < .05$ **$p < .01$

Table 4

Infants' responses to physical contact with mother in the fourth quarter

	% Positive response to hold	% Negative response to hold	% Positive response to P/D	% Negative response to P/D	% B initiates P/D	% B initiates P/U
% Positive response to hold	...	-.38	.40*	-.39*	-.25	.42*
% Negative response to hold	-.38	...	-.28	.05	.65**	-.29
% Positive response to P/D	.40*	-.28	...	-.61**	-.48*	.36
% Negative response to P/D	-.39*	.05	-.61**	...	-.07	-.25
% B initiates P/D	-.25	.65**	-.48*	-.07	...	-.30
% B initiates P/U	.42*	-.29	.36	-.25	-.30	...

* $p < .05$

** $p < .01$

Table 5

Maternal behavior in physical contact with infant in the first quarter

	Mean duration of P/U	Mean duration of non-routine P/U	% Tender, careful holding	% Inept holding	Frequency episodes of P/U per hour	% Affectionate P/Us	% Abrupt P/Us
Mean duration of P/U	...	.62**	.24	-.07	-.38	.46*	-.06
Mean duration of non-routine P/U	.62**	...	.30	-.29	-.21	.46*	-.16
% Tender, careful holding	.24	.30	...	-.61**	-.22	.48*	-.55**
% Inept holding	-.07	-.29	-.61**	...	-.05	-.23	.72**
Frequency episodes of P/U per hour	-.38	-.21	-.22	-.05	...	-.06	.04
% Affectionate P/Us	.46*	.46*	.48*	-.23	-.06	...	-.15
% Abrupt P/Us	-.06	-.16	-.55**	.72**	.04	-.15	...

* $p < .05$ **$p < .01$

Table 6

Relationships between maternal and infant

behavior in physical contact in the fourth quarter

	Maternal behavior			
Infant behavior	Mean duration of non-routine P/U	Frequency episodes of P/U per hour	% Affectionate P/Us	% Abrupt interfering P/Us
% Positive response to hold	.60**	-.44*	.46*	-.45*
% Negative response to hold	-.38	.18	-.34	.64**
% Positive response to P/D	.45*	-.41*	.37	-.17
% Negative response to P/D	-.05	.53**	-.05	.01
% B initiates P/D	-.43*	.27	-.20	.57**
% B initiates P/U	.34	-.04	.32	-.27

* $p < .05$

** $p < .01$

Table 7

Relationships between maternal behavior in physical contact in the first quarter and infant response to physical contact in the fourth quarter

Infant behavior in fourth quarter	Maternal behavior in first quarter: Mean duration of non-routine P/U	% Tender, careful holding	Frequency episodes of P/U per hour	% Affectionate P/Us	% Abrupt P/Us
% Positive response to hold	.47*	.46*	-.44*	.22	-.43*
% Negative response to hold	-.06	-.28	-.03	-.17	.32
% Positive response to P/D	.26	.26	-.14	-.16	-.18
% Negative response to P/D	-.15	-.06	.40*	.23	.10
% B initiates P/D	-.08	-.10	-.02	.21	.04
% B initiates P/U	.50**	.13	-.02	.07	-.23

* $p < .05$

** $p < .01$